Scientific Sloyd

Molander

To

The President of

The University of Toronto

Very respectfully

from

Anna Molander

June 1902

SCIENTIFIC SLOYD

A NEW ORIGINAL SYSTEM

FOUNDED ON GEOMETRICAL PRINCIPLES

FOR TEACHERS COLLEGES, AND FOR PRIMARY, ELEMENTARY, AND GRAMMAR SCHOOLS

BY

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Part I.—General Comments

WHAT "SLOYD" MEANS

"Sloyd" is the verbal expression for a combined mental and manual training along correct pedagogical lines. Its purpose is a distinct educational one in opposition to the merely domestic and mechanical industries. The word "Sloyd" is derived from the Swedish language.

THE EDUCATIONAL AIMS OF SLOYD

Surely no teacher of any other subject will have to hear the question, that frequently is put to the Sloyd teacher by conservative people: "Of what use is it to learn Sloyd?" The answer will in the next pages be dealt with from five different views:

1. The Intellectual. 2. The Manual. 3. The Psychological. 4. The Physiological. The Sociological.

1. Intellectual.—The gradual working through successive steps renders general development for the nerve-cells of the brain, and creates order of

thoughts and self-judgment. Here is no dead technical exercise, but life and reality. The useful model invigorates the creative power. The sense of observation is strengthened by learning to judge about different substances, structure and properties of wood, the quality of tools, etc. And especially by the geometrical method set forth in this book the elements of geometry are acquired without any extra effort or straining. This geometrical system creates a taste for simple, beautiful, and rational forms, and the geometrical constructions develop the pupil's reasoning power.

2. **Manual.**—The hand is trained to be a ready servant and medium for the brain. General dexterity is promoted and the pupils become more practical.

3. **Psychological.**—The Pedagogical Sloyd builds a road between the brain and the fingers, and produces presence of mind and readiness to face emergencies. Sloyd thus helps to develop an energetic, courageous and self-relying character. The children are gradually trained towards a feeling of self-help and independence; they learn to acquire something by their own work without the aid of the almighty "penny", and are in that way led to find themselves useful members of the community. This feeling of ability will elicit patience and perseverance with the

work, will give the children a power of concentration, and envigorate their faculties of attention, accuracy, order and carefulness.

4. Physiological.—By equal work with both hands the body grows symmetrically. The muscular strength is promoted, and the bodily exercise gives counterbalance to mere brain training. Also the eye gets a very good training, and the eye-measure is developed to an extent which can not be obtained by merely drawing lessons.

5. Sociological.—Sloyd makes the pupils independent and quick and ready to help themselves and others in their future life. It keeps the boys from mischief and renders a pleasant occupation for leisure hours. It trains to neatness and punctuality. The useful model is attractive for the pupil, as he finds himself able to do something for his home.

Sloyd promotes a good discipline not only for the school, but also for life. While handling sharp tools, which are useful, if properly and discriminately handled, but dangerous not only for themselves but also for their fellow scholars, if carelessly and thoughtlessly used, the pupils develop attentiveness as to their own acting and acquire also consideration for other people's safety and welfare.

Sloyd creates respect and consideration for manual labor and a closer understanding and

appreciation of the workingman. It promotes the national bravery. The sloyd girl would certainly not faint at the sight of a sharply ground tool or weapon, as we sometimes read about of delicately brought up ladies.

THE HISTORY OF SLÖYD

The practical sloyd actually dates back to that time, when the human being had acquired the ability to place the tips of the other four fingers against the point of the thumb, though at that time it surely was no science, merely hard necessity.

A better illustration has never been written of the mutual working of the brain and the hands spurred by necessity than we find in "Robinson Crusoe."

During the last centuries thoughtful pedagogues in Germany, in England, and in France have earnestly urged the necessity of observing not only the brain power of a child, but also the development of dexterity. But as the brains invented machinery and the machines could provide the necessities of life so much more easily than the hands did, the training of the latter became more and more neglected both at home and in school, especially amongst the greater nations.

In the little country Finland, far up at the Polar circle, there emanated a law in 1866 to the effect that Sloyd should be of the same impor-

tance in all the state public schools as were the literary subjects.

It was Sloyd in wood, in metal, in knitting, sewing, spinning, weaving, straw—bast—chips —wicker—and root work, etc.

Then about a decade later on there arrived a Swedish gentleman at one of the educational exhibitions of Finland. He took particular interest in the wood Sloyd, and being a rich man and interested in educational enterprises, he made propagation for this branch almost all over the civilized world. And that is the reason that now-a-days most people with the word "Sloyd" understand only woodwork. He also worked out a system of his own in wood Sloyd that goes in educational circles under the name of "The Swedish Sloyd System".

From Finland, from Sweden, from Denmark, the Sloyd ideas emigrated to the United States. And many signs point out that they may have a greater future there than at any of their birthplaces. Different Sloyd systems are varying as to the details, but the most of the great educational aims are mutual for all of them.

AGE OF THE PUPILS

If the pupils have had previous kindergarten training, they may begin with my Sloyd system at the age of seven, but if their fingers are totally untrained, then they must wait until they are nine, or at least eight years old. They may be ever so clever readers, but if their hands have been trained by nothing but writing, then there exists hardly any communication between their brains and their fingertips, and only a more advanced age can bridge over this gap.

If they be prepared to commence at seven, by the age of fourteen they ought to be through all the seven standards by four hours weekly work on an average.

Little girls acquire and develop while playing with their dolls a certain degree of handiness, so they will be apt to begin at the age of eight, even though they lack previous kindergarten training.

Older pupils, who have done no Sloyd work before, should begin with Standard I at any age, though they naturally will proceed quicker through the different standards then the little ones can do it.

Teachers who are training for the system should of course always begin with Standard I, even if they know other systems of wood work.

THE SLOYD ROOM

The Sloyd room should be nothing of a "workshop". It should not under any circumstances be in the basement floor, as still is the case on many places, being a reminiscence from the "workshop" ideas of the older school. The Sloyd room should on the contrary be even more light and airy than any of the other class-rooms, with the exception may be of the gymnastic hall. For the bodily work, that is carried out in the Sloyd room, promotes naturally a deeper respiration than is the case with other sort of school work, and consequently the air that is inhaled must be of as good quality as possible is obtainable for a class-room. Also for the sake of preserving the models, the material, and the tools it is indispensable that the Sloyd room should be free from dampness.

If during winter time the Sloyd room is heated, the temperature of it should by no means be so high as in the ordinary class-rooms. The physical exercises caused by Sloyd work give warmth enough without much artificial heating. At any rate the Sloyd room should never be kept warmer than the gymnastic hall.

WORK BENCHES

If the class-room already is supplied with common work benches they will do for the purpose, but if not, then I would prefer the following arrangement:

From common timber 1½ inches thick and 16 inches wide are made out pieces of 72 inches length. From each piece are cut out two semicircles 16 inches in diameter, with a regular distance between each. These timber pieces are fixed horizontally upon blocks of the same width. The blocks are fixed to the floor in such a way that the benches are accessible from both sides. Some of the benches should be of the height of 32 inches, others of 27.

Between the semicircles are bored larger and smaller holes to hold the tools. These holes should however not occupy more than half of the width of the bench, as the front part is needed for the work. And the back part of the benches is lined with thinner boards.

These work benches are used for the vertical work that the pupils have to execute, and also for some of the horizontal movements. But for several kinds of horizontal work, such as planing and filing edges, etc., the above described

benches can not be used, and a different kind is to be made for that purpose by putting up the timber pieces in a perpendicular position upon blocks, which are fixed to the floor. The upper edge of these boards should be 30 inches from the floor and some of them 27 inches, corresponding with the horizontal benches.

By small iron bench clamps the work is fastened to these two different kind of benches. As soon as I give the bench clamp into the children's hands, I do not fail to make them to observe that the screw, if turned downward, opens with the sun and closes against the sun, while if turned upward the effect is the opposite one. I then tell them that so is the rule for every screw in the whole world, and after that they never in their future work will have to stop and hesitate which way to turn the screwdriver.

But if these clamps are supplied with the instantaneous grip, as it is most desirable that they should be, then the exercises with the screw will have to be deferred until the pupils are going to learn to screw the saws into the handles.

For the teacher there should be in the Sloyd room a small but high platform, and on that should stand a separate bench, at which the teacher can do all the demonstrations and show the different ways in which the tools should be used.

POSITION WHILE WORKING

The higher work benches are intended for those of the pupils who do their work in a standing position, and the lower for those who are sitting while working. For I do not believe in a method that compels the little children to stand upon their tiny legs all that time they spend in the Sloyd class. Some part of their work can be done just as well while they are sitting down, especially the piercing with the star—and the scroll-saws, the modelling with the Sloyd knife, and different kinds of filing. The pupils will themselves very quickly acquire the discrimination as to which position is the most suitable for the work as well as for themselves. And as the Sloyd teacher ought to possess a thorough knowledge of anatomy as well as of physiology, she will by a glance be able to judge whether the position of the child's body during the work is a good one, that is promoting the development of the muscular strength, or an injurious one, which of course is instantly to be corrected.

If this rule is kept up conscientiously, that the Sloyd teacher should be a pedagogically trained teacher, and not merely a skilful carpen-

ter, then it is not necessary to do as some of the Sloyd systems require.

For an essential part of these is to cover the walls of the Sloyd room with large pictures showing the right and the wrong position of the body while using every different kind of tools. Besides the queer idea of reproducing in a picture one or two wrong positions, while the wrong position can be of various sorts, those pictures that represent the very right position will at length prove to become an obstacle to the teacher, because they prevent the introduction of improved tools, which might require a different position of the body from any one that is provided for in these authorized wall-pictures.

I happened once to be at a landing stage, when a trades union returned from a picnic. It struck me that every man in the party had his left shoulder higher than the right, and the older men more so than the younger ones. I at once presumed them to be carpenters, who had got their frame deformed by a life-long, one-sided work at the bench. Subsequent inquiries confirmed my supposition. The consequent warping of their brains was not visible, but it was surely there.

A friend of mine went to a Sloyd school in Sweden and stayed there for two years, diligently working, according to the method of that place.

When she came back her right hand had grown so much larger than her left one that for all her lifetime she will have to use gloves of a different number for each hand.

The Danish method provides alternate work for both hands.

A farmer possesses as a rule a more vivid intellect and a better health than a craftsman. That has hitherto been attributed to the influence of the better air he enjoys, but surely the more harmonious bodily motions rendered by field labor than by a trade count for a great deal.

In all the following exercises the children are to be trained to use not only the right hand but also the left one as much as possible, especially when sawing, planing, filing, and sandpapering. This for the sake of the harmonious development of both sides of the body. That special kind of work benches, which I have just given a description of, have been designed by me particularly for the purpose of promoting alternate work with both hands. If common work benches are used, they must be supplied with one row of holes along each side—such as the Danish are—lest the pupil be forced to work one-sidedly.

WOOD

Little children can not be expected themselves to prepare out of a log by means of the axe and the jack plane the required material for their work. They must get the wood ready prepared from a saw mill; $\frac{3}{8}$ of an inch thick.

Two hundred square feet will do for a beginning. The boards should be, as far as possible, of assorted width, from 6 to 20 inches wide.

The material to be used should be at the same time cross-grained and not too hard. The best kind of wood for this purpose is the American Liriodendron tulipifera (Tulip-tree). It goes in the common timber trade in London under the name American white wood. But as in the English language the name of white wood is given to different kind of wood, it will be best to keep to the Latin name.

If it should prove to be impossible to get the American white wood, then some of the following sorts can be used: American lime-tree (Tilia Americana); Black poplar (Populus nigra); Sycamore (Acer pseudoplatanus); Scarlet maple (Acer rubrum); Yew (Taxus baccata).

A few square feet of Weymouth pine (Pinus

strobus), ½ inch thick, should also be ordered for the purpose of whittling and gouging.

It is a great blunder not to supply the very best kind of material for the little children. If the wood is too hard, they will get discouraged, and if it is too fragile, they will develop a destructive manner.

During the four first Standards the pupils will have quite enough to do in learning the geometrical figures, all the different exercises, and the use of the tools, so I do not at this stage require that they should go deeper into the study of the different kinds of wood suitable for Sloyd work. The acquisition of that knowledge comes in at Standard V and should then go hand in hand with lessons in botany, given of course by the Sloyd teacher.

TOOLS

There is still left not only in the Manual Training systems but also in some of the Sloyd systems, a trace from the past in the notion that children should be forced to accomplish their wood work by means of as few and as old-fashioned tools as possible. That idea hangs on, and has wrongly been brought into the class-room from that time when wood work was no school subject, but simple a trade, contrived for the acquiring of a livelihood, which was meager enough to prevent the purchase of new and improved tools of various sorts. And one can still behold tools of a very old-fashioned and inappropriate style used in the Manual Training departments of schools, where it never for a moment would occur—say to the teacher of penmanship—to train the pupils of to-day to use the feather pen of grandfather's time.

By using only a few and imperfect tools the pupils will become automatical and slow, not only at the wood work, but in their perception at large; while a great variety of tools, which are up to date, will quicken and sharpen their faculties of discrimination and observation with

regard to the best means of gaining a desired purpose.

The great objection to letting little children under ten begin with wood Sloyd has been the danger of the sharp tools in a child's hand. If there is any real danger, then it comes especially from the knife. I mean the genuine Sloyd knife, not the pocket knife, which should be entirely abolished from the Sloyd room.

The knife is beyond question the best educational medium amongst all the tools, because it is the least mechanical of them all and hence requires the greatest individual attention and by that develops the accuracy and the self-judgment of the child. The real educational influence caused by the use of the knife can not be fully replaced by any joint action of different other tools. Yet I hesitate to let little children use that sharply pointed tool, and suggest substituting for it a knife with two handles, a kind of a small drawing knife. That knife can also in many cases replace the spoke shave, which is a very mechanical tool, because the child can not *see* the cut that is made, and only has to take the strokes by chance. For the same reason I often prefer in a child's hand the straight cabinet scraper to the smoothing plane. In the following Sloyd series the saws have a predominant place as producing tools.

To children should be given tools only of the best kind of material. For here comes in the same comment that was made concerning too fragile wood. And compasses, marking—and mortise—gauges, try squares, bevels and rulers should be graded ones.

In order to secure tools of good quality, it should be observed at the purchase that the name of the maker is on all the tools.

The handle of the tools should not be polished; if they are, the polish should be rubbed off with sandpaper. Polished handles slip from the hand so easily, and the pupils might hurt themselves or each other in that way.

For cleansing the tools vaseline is much preferable to linseed oil, because of being volatile, so if some spots of it should happen to come on the wood, it will evaporate within a very short space of time.

Tools which the pupils are in constant need of, should stay on the work benches; but tools which are not frequently used are to be kept on special tool shelves. It is important to observe that these tool shelves should be detached from the walls of the Sloyd room. For the walls are as a rule more or less damp, and the shelves will, if placed close to the walls, absorb the dampness, thus causing the tools to contract rust.

As Sloyd is a comparatively new school sub-

ject, the terminology of it is not settled as yet. There exists a great difference in the terms accepted by different systems and used at different Sloyd schools. This concerns especially the names of the tools. One can find the same tool called by quite different and often even contrary names in the different schools. And with no one of the tools is the confusion more puzzling than with all the sundry names that are bestowed upon the saws.

DRAWING

Every pupil should have a drawing book, in which the geometrical design for each piece of work is drawn up. Geometry is the foundation for my whole system, and the geometrical figures go through all the Standards. The measures for the drawings, as well as for the models, should, as far as possible, be the same for all the pupils; the drawing of course being on a smaller scale than the models. As a rule the drawings should be a third of the size of the actual model.

It should be observed that all the drawings in this system are geometrical drawings and not working drawings.

The pupils should themselves make up the designs for Standard IV, V, VI, VII.

WORKING METHOD

Children should never be forced to do anything that is beyond their capacity. If the pupils are expected to produce something that is too hard for them, they will get careless and develop inaccuracy and content themselves with a poorly finished work, and will at the same time acquire a tendency to overestimate their own ability, while again on the contrary, pupils possessing a keener self-criticism will get discouraged at perceiving their own shortcomings, and will thus be led to lose confidence in their own working capacity. Both extremes are deplorable and are to be avoided by working along carefully graded steps, so the pupils gradually obtain a greater ability and an increased discrimination and confidence with regard to their own skilfulness. The following Standards have been arranged according to these educational aims for gradual development of all the faculties of the pupil's body and soul.

Class instruction is essential, though the teacher has at the same time to give attention to each individual pupil. When, during the course of a lesson, instructions and explanations are to be

given to the whole class, a pause in the work is required by means of ringing a small hand bell, thus calling for quietness and attention to the general information that the teacher finds it necessary to impart at intervals. A second ring notifies when the class work again is to take place.

The pupils should not be forced to copy the model too slavishly. Should emergencies arise, they may be allowed a little diversion as to the exact measures of the model. It is a pedantry hateful for children's conception that they should be compelled to make over again a model that can be just as good on a somewhat smaller scale.

It is almost needless to mention, that varnishing or polishing of the models is out of the question, as that would conceal good workmanship and cover a poor one.

As it is an undisputable fact that some children are brighter and quicker than others, these should be allowed to do extra work besides the regular models. But these works should be kept in strict accordance to the geometrical figure that gives foundation for the regular model, though to avoid monotony the pupils who are doing this extra work may be allowed to step either inside or outside of the exact dimensions of the model.

Several old Sloyd systems in difference from this do not give place for any extra work, but the pupil has to go on with one model after the other one, with the result that the stronger and quicker pupil might be at the model No. 50, while another pupil, who commenced his Sloyd course at the same time, is at say the model No. 30. This makes class instruction quite impossible.

Part II.—The Seven Standards

STANDARD I

The First Year's Course. Four hours weekly. 25 models. Age 7–8.

When the square has been demonstrated on the black-board and drawn up by the pupils in their drawing books, it is with guidance of the try-square drawn upon the wood, which is clamped above the cut out triangles on the horizontal benches.

1. This square should be 6 inches wide. Small hand saws are in this case the best implements, and after the square is sawn out, the child moves it over to one of the vertical benches on purpose to smooth off the edges. For those that go across the grain either the block plane or the flat file is used, and with the grain the drawing knife, whereupon the pupil returns to the horizontal bench and smoothes both surfaces with the scraper and with sand and flint paper wrapped around a block of wood.

Now the great question will arise, for what purpose this neatly finished square can be used. I let the children themselves make the suggestions

and their fancy is vivid, but the most of them decide to give it to their mother for a *Tea-pot stand.* I always let the pupils keep their work themselves. Grown-up people as a rule enjoy the fruits of their labor, so why should not the little ones have the same privilege?

When completing all the models from No. 1 to No. 15, the edges that go across the grain should be finished before those which go with the grain. And the models should also be cut out a little wider than the exact measure, thus providing a small allowance for splitting at the corners by the untrained hand, while planing the edges across the grain.

2. The next model represents the rectangle. Three equal rectangles—12x6 inches—are drawn by means of a ruler and the try square, and sawn out with the hand saw. The short sides are smoothed with the block plane and the long ones either with the drawing knife or the jack plane.

It should not be omitted to make the pupils observe that when using the drawing knife, the spoke shave, or the jack plane for the edge, or the smoothing plane for the surface, the work should be turned and only half of the distance be trimmed at times. It should also be pointed out that while using the jack plane or the smoothing plane the working force does not act quite

horizontally, though it seems so, but that the motion should describe a slight curve, the deepest part of which is just there, where the cutter strikes. This simple explanation will help the pupils to better grasp the idea of planing.

At an equal distance from all the corners holes are bored with a drill, and the surface of each rectangle is smoothed either with the scraper or the smoothing plane and also, if needs be, with sand and flint paper. Braided cords are threaded through the holes, and knots made on the cord right under each shelf. In order to keep the shelves steady there should be stuck small pins through the knots. These pins are cut out with the chisel from a piece of wood which is $1\frac{1}{2}$ inches wide, thus making the pins of a similar length, whereupon they are smoothed with the Sloyd knife. When all the three rectangles have been put up in this way, all the four cords are joined in a knot, and the whole thing is hung on a nail on the wall. And the little pupils will find to their great delight, that they already at this early stage have been able to make a *Book-shelf* for themselves, or—if they prefer it so—for some other person.

While producing the book-shelf the following muscles are engaged:

Extensors (the saw), Flexors (the drawing

knife), Rotators (the drill), thus promoting the harmonious development of the body.

When the saw is drawn towards the body no force should be used, and consequently no cut made; whereupon it is pushed outwards with great force, thus producing a deep cut for each movement.

As already at this early stage the different ability of the pupils will come forth, those who have hard to keep up to the average may be allowed to make only two shelves.

But those who are strong enough to use the jack plane with advantage, may plane up the long sides of all the three shelves at the same time, putting them together into the vise.

3. *A Ruler*—12x2 inches—is the next model. A smooth edge is planed up with the jack plane. The width is traced with the marking gauge, the long side sawn with the hand saw and the short sides with the tenon saw. The block plane and the drawing knife are used for the edges, and a hole is bored with the center-bit at one of the ends. Then the ruler is trimmed with the scraper or the smoothing plane and with sand- and flint-paper.

When using the drawing knife it should be observed that if the slanting side of the cutter is turned upwards, then the knife makes a deeper

cut, while if the straight side is upwards the cut gets smaller.

4. Now again a rectangle—6x4 is produced and a diagonal drawn. This is divided along the diagonal into two equal parts; and the pupil finds that he by this has got two right-angled triangles, which after a hole has been bored in the right-angled corners and the trimming done in the usual way, can be useful as *Marking squares* or *Rulers*.

It will be observed by the experienced reader that at the production of this model comes in the oblique sawing and the oblique planing.

Another marking square can be made like this ⊥ as extra work, the angles being smoothed with the flat file.

5. Again a square—9 inches—is sawn out; each side is divided into three equal parts and the connecting lines are drawn up between the marked points, thus dividing the big square by the lead pencil marks into 9 small equal squares. The four corner squares are sawn out with the tenon saw and there will remain a regular *Cross*, which after having been trimmed with the planes, the drawing knife, the flat file, and the papers can be used for a *Vase stand*, or anything else the child likes to use it for.

6. Another square—8 inches—is sawn out and is to form a different kind of a *Cross*. Each side

is divided into four equal parts. The both middle parts of every side are to form the hypothenuse for right-angled isosceles triangles, which are sawn out with the compass saw. The remainder, a cross with pointed ends, is trimmed in the same way as was the previous cross.

7, 8. But the four triangles, just sawn out, are not to be thrown into the waste box. The two of them which go with the grain, can trimmed up be used as small *Rulers*, while the two triangles which are cut out across the grain can be cut with the chisel into the shape of *Key tags*, consisting of a rectangle and a triangle. In this way the children will learn to economise material.

9. A narrow rectangle—5x1½ inches—and an isosceles acute angled triangle will form a *Flower label*, the pointed end to be whittled thinner with the Sloyd knife.

10, 11. A square—6 inches—with an equilateral triangle on each one of two opposite sides; and a rectangle—10x5 inches—with one equilateral triangle form useful *Stands for flower pots.*

12. A *Decanter tray* can be made in the shape of a trapezium, which figure at the same time can for the children serve as an illustration for the form of life.

13, 14. A rectangle—12x3 inches—with an isosceles triangle upon the long side, and another

rectangle—10x4 inches—with a similar triangle on the short side will, supplied with necessary screws and hooks, make the first one a *Clothes rack* and the other one a *Key board.*

15. Nothing can interest the pupils more than to mark out a circle with a pair of compasses and then saw out their "wheel" or *Discus.* For this work the compass saw is used. A diameter of 9 inches will be the best. If there appears some unevenness in the circumference, it can be smoothed either with the concave spoke shave or with the round side of the rasp. And then the little pupils may have their wheels to play with.

16. A larger circle is made—say 12 or 15 inches diameter—for a *Bread tray.*

17. The next circle—6 inches diameter—can be made into a *Sponge holder.* For that purpose there are bored holes in concentric circles along the radius in that way, so that the biggest drill bit is used for the centere and then gradually smaller and smaller towards the circumference.

It should be observed not to bore the holes right through from one side, but to turn the work as soon as the bit has pierced through to the opposite side, and then complete the boring from that side, thus preventing the wood from splitting.

The holes are smoothed with the round file, and the edges are bevelled with the drawing knife. After that the trimming with sand- and flint-paper is to be done, and there are thread cords through the holes of the outer circle, these cords are joined in a knot about 8 inches above the bottom, and the sponge holder is finished.

18. Three *Circles of equal size*—5 inches diameter—can be arranged in the same way as was the book-shelf consisting of three equal rectangles.

19. A larger circle—6 inches diameter—and a smaller—4½ inches diameter—joining each other and rounded along the edges with the drawing knife and smoothed with the half-round file and the papers will make a *Tray* for a decanter and a glass. While completing this model the pupil will get experience in concave as well as convex shaping.

20. A rectangle—12x8 inches—with a semi-circle at one of the short sides; or another rectangle—10x7 inches—with semi-circles at the both short sides, will form two different kinds of *Cutting boards.*

21. A square—7 inches—with a semi-circle on one side, to which is joined a long and narrow rectangle—24 x 2 inches—with a semi-circle at the upper end will make a *Spade* to dig into the

sand with. The handle is rounded with the concave spoke shave, and the spade is bevelled on both surfaces with the plane, and along the two opposite edges with the drawing knife.

22, 23. A *Cake spoon* and a *Butter spoon* can be made in the same way. For the cake spoon the square is 3 inches with semi-circles on two of the opposite sides, and the rectangle is 8x1½ inches. For the butter spoon the square is 3 inches with a semi-circle on one side, and the rectangle 5x1½ inches. The former is perforated with the centerbit and the latter moulded with the reeder. The edges of the spoons are bevelled either with the drawing knife or the spoke shave and the handles are rounded with the Sloyd knife.

24. From a long and narrow rectangle –8x1½ inches, with semi-circles at both ends, is made out a *Paper knife*, the edges sharpened with the concave spoke shave.

25. A rectangle—24x13 inches—with a semi-circle—16 inches diameter—sawn out from one of the longer sides will make a handy *Writing board* to be held on the knee.

Every article is of course trimmed with files and sand- and flint-paper.

STANDARD II

The Second Year's Course. Four hours weekly. 25 models. Age 8–9.

1. When the children are going to draw up a hexagon I do not of course tell them only to mechanically take the length of the radius and divide up the circumference into six equal parts. But I tell them that wise men have found that in every circle the circumference is about three times as long as the diameter, and then the little pupil will find for himself that the radius, being the half of the diameter, will go six times into the circumference.

For juxtaposition of figures no geometrical figure is more available than the hexagon. The children's power of invention will here get a good field for exercise.

2, 3, 4, 5. Two equal hexagons, or three, or four, or five put together can make *Table mats*, or *Easels*, or *Vase stands*.

6, 7. Seven equal hexagons will make a fine *Tray*, while the half part thereof can be a pretty *Bracket*.

8. For the construction of the pentagon the protractor is needed.

9. Two equal pentagons put together can be a *Table mat.*

10, 11. One pentagon and one hexagon can together be either a *Decanter stand* or an *Easel.*

12. The octagon may be constructed either by means of a circle or a square.

13. Two equal octagons will make a *Table mat.*

14. And five equal octagons a *Tea pot stand.*

But other juxtapositions of that figure are not used until in the next Standard.

15. For the construction of the heptagon the protractor is used.

16, 17, 18, 19. 20. Now the children may be allowed to draw up "*Stars*" inside the pentagon, the hexagon, the octagon and the heptagon.

It is a great delight for them to saw out these "*Stars*", which can be used for various purposes. When trimming them the three-cornered file is employed.

21, 22, 23, 24, 25. On the sides of the various geometrical figures, which the children have learnt to know during the previous exercises, viz., the triangle, the square, the pentagon, the hexagon and the octagon, we draw arcs either convex or concave. The figures thus constructed are sawn out either with the compass saw or the bow saw and can be used for *Vase*

stands, *Cutting boards*, *Table mats*, *Lamp stands*, *Trays*, etc. The arcs are trimmed with the drawing knife, the curved spoke shave and the half round file.

STANDARD III

Third Year's Course. Four hours weekly. 20 models. Age 9–10.

For this Standard the same principal geometrical figures are used as in the previous Standards. But now the pupils begin with piercing work. All the different sorts of drills are here used to great advantage. Compass saws and bow saws are employed. For the purpose can also be used star saw blades or scroll saw blades screwed into extension saw frames. To learn to screw in those saw blades the pupils need a special exercise. It amuses them to find that it has some similarity to the tuning of a fiddle. To be able to turn the big screws they need a pair of pinchers, and in order to adjust the opposite small screws they will have to learn the use of the screw driver.

The pupils should at this Standard be trained to make decorative designs with the drills, thus developing artistic taste and practical imagination.

1. A square with a smaller square cut out from the center part will make a useful *Flower pot*

stand. The outside edges are trimmed in the same way as was the square in Standard I, while the inside edges are trimmed with the flat file and the three-cornered file.

2. The next model is a right-angled isosceles triangle with a smaller similar one cut out. This will be good for a *Ruler* or a *Marking square.*

3. A rectangle with a rhombus cut out can be useful as a *Stand for a pan.*

4. Parallel rectangles cut out from a large rectangle with borders left along the short sides will serve as a *Flower pot stand.*

5. Symmetrical squares cut out from a rectangle are a good demonstration for *The square measure.*

6. A circle with a smaller circle cut out will make a *Stand for a butter dish.*

7. A still smaller one a *Stand for the ink bottle.*

8, 9. *Clothes-pins* and *Flower ladders* are useful models.

10, 11. Also *Button sticks* and *Knob sticks* of various kind.

12, 13, 14, 15. *Picture frames, Mirror frames, Calendar frames* and *Embroidering frames* are made of different kinds.

16. Six octagons in juxtaposition will make a *Mat.*

17. A *Tool rack* is made of a rectangle with a double row of small rectangles cut out.

18. *Spoon shelves* are made from semi-circles with concentric arcs cut out.

19. *Candle saves* from two concentric circles, the inner bored out with the expansive bit from the larger one.

20. A perforated *Fish spoon* is made in the shape of a pentagon with a handle.

In order to accomplish neatly this Standard the pupils will have to develop much accuracy and great carefulness. They will learn to appreciate the beauty of regular and symmetrical figures and at the same time they will acquire a steady foundation for further geometrical studies.

STANDARD IV

Fourth Year's Course. Four hours weekly. 15 models. Age 10–11.

Here the third dimension comes in, i. e., the height. This Standard is a combination and a repetition of the geometrical figures of the first Standard. For this Standard as well as for the following Standards are not given very minute explanations, but much is left to the teacher's own judgment.

The pupils should themselves make up the designs, because there should not be put a bridle on their creative power by too much guidance and provision.

The most of the joinery should be done by means of screws and only a smaller portion with nails or glue things.

For models are given the following suggestions, and all should be in keeping with the progression of the geometrical figures.

1. *Pencil rack.*—A square for the bottom; and two equal right-angled isosceles triangles for the sides.

2. *Book stand.*—A rectangle for the bottom

and another one for the back; and two equal circle quadrants for the sides.

3. *Dog's meat cup.*—A square for the bottom; three rectangles for the sides and front; a rectangle with an abridged isosceles triangle for the back.

4. *Honey comb box.*—A square for the bottom and four rectangles for the sides.

5. *Pencil box.*—Five rectangles.

6. *Boot brush box.*—Six rectangles.

7. *Cat's meat cup.*—A square for the bottom, three rectangles for the sides and the front, and a rectangle with a circle segment for the back.

8. *Salt box.*—A square, perforated with drills, for the bottom; a rectangle for the back; and three smaller equal rectangles for the front and sides.

9. *Chopping board.*—A rectangle for the bottom; three rectangles for the sides and the front; a rectangle with an abridged isosceles triangle for the back.

10. *Lamp shelf.*—A semi-circle for the shelf and a right-angled scalene triangle for supporter.

11. *Corner shelf.*—A circle quadrant for the shelf, and a right angled scalene triangle for supporter.

12. *Knife and fork box.*—Five rectangles for

the bottom and the sides, and a circle segment for the division.

13. *Coal shuttle.*—Several rectangles, squares and abridged triangles.

14. *Handkerchief box.*—A square for the bottom; and four equal rectangles with semi-circles on one of the longer sides, for the sides of the box.

15. *Book shelf.*—Several rectangles, some of them with circular designs.

STANDARD V

Fifth Year's Course. Four hours weekly. 20 models. Age 11–12.

At this Standard the pupils should begin to study—in connection with botany—the quality of different kinds of wood.

They may also at this stage be intrusted with the care of the tools, and learn to cleanse them with vaseline and to take off rust by means of emery cloth.

This Standard is a combination and a repetition of the geometrical figures of Standard II.

As models may be used following things:

1. *Hat rack*—Four equal hexagons in one line.

2. *Newspaper case.*—Five hexagons in juxtaposition for the front, and a rectangle for the back; several long and narrow rectangles for the stands.

3. *Tool box.*—Four rectangles, and four abridged isosceles triangles.

4. *Plate rack.*—Several rectangles with circular designs.

5. *Paper basket.*—A pentagon for the bottom,

and five equal, abridged, isocsceles triangles for the sides.

6. *Tooth brush shelf.*—Four hexagons in juxtaposition for the shelf, and two similar hexagons for the back; holes bored for the brushes.

7. *Easel.*—Five hexagons in juxtaposition for the front; a half hexagon for the list; and an abridged triangle for the back.

8. *Match box holder.*—Two pentagons for the back, and two rectangles for the support of the box.

9. *Bracket.*—A pentagon for the shelf, and a pentagon and a hexagon for the back.

10. *Card basket.*—A triangle for the bottom, and three semi-circles for the sides.

11. *Work basket.*—A square for the bottom and four semi-circles for the sides.

12. *Soap box.*—A rectangle for the bottom, and four semi-circles for the sides; the bottom perforated with the center-bit.

13. *Fruit basket.*—A pentagon for the bottom and five semi-circles for the sides.

14. *Glove box.*—A rectangle for the bottom, and four rectangles with concave arcs for the sides.

15. *Bric-a-bac stand.*—Three equal squares with concave arcs on the sides; four long and narrow rectangles for the legs.

16. *Brush rack.*—Two equal hexagons and two equal pentagons for the rack; two equal right-angled scalene triangles for supporters.

17. *Music stand.*—Six octagons in juxtaposition for the front, and a rectangle for the back. Several long and narrow rectangles for the legs.

18. *Pipe rack.*—Four triangles with decorative designs for the back; a larger and a smaller circle quadrant for the shelves; the upper and smaller shelf with a concave arc cut out from the edge. Holes are bored in the shelves with the expansive bit.

19. *Foot stool.*—A hexagon for the top and eight equal right-angled scalene triangles for the legs.

20. *Hymn tablet.*—A large rectangle for the back, and several smaller ones for the shelves; the half part of seven hexagons in juxtaposition, with a cross on, for the top.

STANDARD VI

Sixth Year's Course. Three hours weekly. 15 models. Age 12–13.

This Standard is a combination and a repetition of the figures of Standard III. The pupils will at this stage learn mounting for fixing on locks, hinges, etc. They should now also learn how to sharpen the knifes, the simple planes, and the bits.

1. *Photo box.*—A rectangle for the bottom and four rectangles with cut out designs for the sides.

2. *Shelf for brace bits.*—A perforated semi-circle for the shelf and a rectangle for the back.

3. *Towel rack.*—A rectangle with semi-circles on both of the short sides; and several long and narrow rectangles fixed on with hinges.

4. *Fern basket.*—A square for the bottom and four perforated rectangles for the sides.

5. *Work box.*—A square for the bottom and another for the top, the latter wrought out with piercing work; four equal rectangles for the sides; lock and hinges.

6. *Egg cup.*—Two equal rectangles with cut out circular designs.

7. *Bird's nest.*—To hang in a tree. It is to protect the little birds from the prey birds, while nesting. Four rectangles for the front, the back, the top and the bottom. Two rectangles with two right-angled triangles for the sides. The gateway for the birds is bored in the front part with the expansive bit. A door is arranged at the opposite side for the purpose of clearing out from the nest the old stuff every autumn, when the bird family has moved away.

8. *Cruet stand.*—Two equal circles. The expansive bit is used for boring the holes. Three long and narrow rectangles for the legs of the stand.

9. *Paper and Post card case.*—Several rectangles; and the back part cut out in decorative designs.

10. *Knitting box.*—A rectangle for the top, and an equal one for the bottom; four rectangles for the sides; two rectangles for divisions inside the box. Holes are bored with hand drills in the sides of the box for the purpose of the yarn running through; lock and hinges.

11. *Egg stand.*—Two equal circles, or two equal rectangles. The expansive bit is used for boring the holes. Four long and narrow rectangles for the stands of the shelf.

12. *Watch stand.*—Several rectangles for the

case, cut out in decorative designs. The hole for the watch bored with the expansive bit.

13. *Money box.*—Six equal rectangles, four of them with semi-circles on both the shorter sides; and two of them with semi-circles on one of the shorter sides, the opposite side cut out in a concave arc, thus forming the stands for the box. A square for the door and lock and hinges.

14. *Letter box.*—Several rectangles and triangles; a square for the door; lock and hinges.

15. *Letter case.*—In three divisions; one for answered letters, one for the unanswered, and a third for letters ready to go off. Several rectangles, squares and triangles; two doors, six locks; and hinges.

STANDARD VII

Seventh Year's Course. Three hours weekly. 15 Models. Age 13–14.

Here some parts of the joinery are executed by means of several kinds of wood construction, such as mortise- and tenon-joints, halving and dovetailing. As the chisel is a very dangerous tool for a child, it is suggested to substitute for it as far as possible the use of the auger bit, the key hole saw, the tenon saw, the flat file and the three-cornered file. The pupils continue their practice in sharpening the tools, and learn now to sharpen the chisels, the spoke shaves, the scrapers, the decorating planes, and the saws.

1. *Pickle spoon.*
2. *Pickle fork.*
3. *Racket.*

} Moulding with the Sloyd knife.

4. *Pen tray;* a rectangle.
5. *Pen tray;* a square.

} Gouging.

6. *Square table*
7. *Bed table:* Several rectangles, some of them with circular designs.
8. *Shamrock table.*

} Mortise and tenon joint.

9. *Egg box.*—Ten rectangles and an isosceles triangle.

10. *Nail box.*—Nine rectangles and an isosceles triangle.

11. *Medicine chest.*—Twelve rectangles.

Halving.

12. *Pencil rack.*—A rectangle for the bottom, and two semi-circles for the sides.

Dovetailing.

13. *Envelope case.*—Four rectangles,—two of them with circular designs,—three squares, and an abridged isosceles triangle.

14. *Stamp holder.*—Several rectangles and the half of a hexagon.

15. *Chest* for minerals or shells.

Halving and Dovetailing.

CONCLUSION

As will be seen from the above review, my system in wood Sloyd is especially based upon geometrical principles, and in that way it is essentially different from all other existing Sloyd systems.

It is almost impossible to stipulate exactly how many pupils should be taught at the same time, as that depends upon so many various circumstances with regard to the Sloyd room, the arrangements of other school subjects and classes, the general disciplinary spirit of the school, and especially upon the children's intellect and aptitude to learn. The list of tools is here arranged for a class of 10 pupils.

No form of the monitor system should ever be tolerated. If the classes are too large to be handled by one teacher, then there should be detached from them independent centers, each one in the charge of a fully competent and responsible Sloyd teacher.

It will be understood as a matter of course, that the Sloyd teacher, besides being a trained teacher of a good general education, ought to be especially conversant with the following subjects:

Knowledge about tools and their manipulation; geometry; drawing; anatomy; physiology and hygiene, botany, and the science, art and history of education.

TOOLS REQUIRED FOR A CLASS OF TEN PUPILS

6 Jack planes, 6 Smoothing planes, 12 Block planes, 3 Scraper planes, 2 Rabbit planes, one straight and one curved, 1 Plough, 1 Beading plane.	Adjustable by screw and assorted sizes.
6 Rip saws, 12 Cross cut saws, 12 Tenon saws, 12 Compass saws 6 Bow saws.	Assorted sizes.
3 spring steel Extension saw frames, 8 inches. (supplied with 4 screws).	
1 gross Scroll saw blades No. 10.	
1 gross Star saw blades No. 12.	
6 Rasps, 6 Flat files, 12 Half round files, 6 Round files, 6 Three-cornered files.	Assorted sizes.

12 Bit braces; assorted sizes, and with sorted set of drills (centerbits, auger bits, countersinks, expansive bit, etc., etc.)

6 Automatic bradawls, } Assorted sizes and with
3 Gearing hand-drills. } sorted set of drills.

12 Sloyd knives,
12 small Drawing knives.

3 Straight spoke shaves,
3 Convex spoke shaves,
6 Concave spoke shaves,
1 Reeder and Moulding tool.
} Adjustable by screw.

12 Straight cabinet scrapers.
6 Curved cabinet scrapers.

6 Screw drivers,
6 Chisels,
3 Mortise chisels,
3 Parting tool,
6 Gouges,
2 Skew chisels,
6 Carver's punches with tool pad.
} Assorted sizes.

12 pair of *Graded* steel compasses (8 inches long).
6 Protractors.
12 *Graded* try squares.
12 *Graded* marking squares.
6 *Graded* marking- and mortise-gauges.
2 *Graded* bevel squares.
2 Star wheel markers.
2 Mitre boxes 90° and 45°.

3 doz. small Bench clamps with instantaneous grip.
3 small pair of Pincers.
3 small pair of Pliers.
1 Saw set.
6 Hammers.
6 Mallets.

Sorted sets of nails, screws, knobs, hinges, small hooks, and hasps and staples.

NOTICE.—The handles of the tools should not be polished.

OTHER IMPLEMENTS REQUIRED

A mounted grindstone with treadle and handle, about 14 inches in diameter and 3 inches thick. The trough under the grindstone should be supplied with a tap, so the children can easily empty the water out of it at the close of each lesson.

4 oil stones.

4 chopping blocks; two of them 27 and the other two 30 inches high. The blocks should be solid to prevent noise and from 15 to 18 inches in diameter.

A dozen flat lead pencils.

A dozen red and blue pencils.

A dozen two-feet folding rulers (graded).

2 iron rulers (graded).

A pair of large scissors.

Sand paper, flint paper and glass paper (sorted).

Tracing paper.

Carbon paper.

Emery cloth.

6 razor strops.

1 lb. Vaseline.

Glue and Glue-pot.

A dozen glue pencils.

Black-board.

Sponge for the black-board.

Chalk for the black-board.

A large ruler (graded) for the black-board.

A pair of large compasses (graded) for the chalk-drawing on the black-board.

A big wood clamp, to keep the wood from casting.

A small hand-bell.

A water-can for the grindstone.

Washstand and utensils.

A dozen rolling towels.

A dozen cloth dusters.

6 feather dusters.

3 small hand-brooms.

A large broom.

A dust-pan.

Waste box.

NOTICE.—The Sloyd room should be kept scrupulously clean. Wood is a clean object and there is no excuse for letting the Sloyd room get untidy, and no reason why it should not be kept as fine as any drawing-room.

Adjoining the Sloyd room there should be a small room in which is kept the material stored up for continual use.

The pupils should supply themselves with drawing books and all necessary drawing instruments and materials.

A FEW WORDS UPON "MANUAL TRAINING"

The origin of the present systems of "Manual Training" adopted in England and America emanates from the centennial exposition in Philadelphia, where it was inspired by the Russian exhibit.

The method consists of a repeated training of different exercises—the chisel being the principal tool--and there is given room for only very few completed articles; the making of some useful objects being reserved until the pupils have accumulated and stored up a lot of different exercises. Just as if you would prohibit a child from writing words and sentences until it has reached the highest possible degree of penmanship in forming the different letters.

Such mere technical exercises will surely tend to transform the children into small machines, mechanically moving their hands on purpose to obtain sufficient skill for bread-earning in the future. They can not be expected to take any considerable interest in those mechanical exercises, the final usefulness of which it is rather hard for them to comprehend, wrapped up as it is in the dense cloud called "the Future".

All children are naturally practically disposed and want to turn to immediate use the fruit of their labor. To postpone their enjoying of these fruits until an indeterminable "Future" is to divert the childish disposition into a wrong channel and kill at the birth their childish delight in their own work.

To take an example: If an artist—say a painter or a sculptor—never was expected to accomplish any work until he were able to produce his masterpiece, but always had only to go on practising and practising for a distant and uncertain goal, how *could* he develop any zeal for his undertaking, and how could he ever be expected to complete something great? And yet he would be in possession of more patience and forethought, than we can expect from a child.

Manual Training has nothing to do with education; it is only a special kind of factory work, by which individuals are transformed into living machinery. It is a mere "caste" training for schools frequented by children either of the rich, or by those of the very poor.

The former are enjoying it as a "hobby", that they take up and drop in accordance with their own notions.

The latter, the "pariahs", are expected to take it up and to stick to it as to an unavoidable duty. For how could there otherwise be secured

carpenters and cabinet makers and builders and shipwrights, etc., for the future, now that the workmanship of the building trades—preserved from the mediaeval time by generations—is vanishing to an alarming extent, and that the iron-machinery can not after all fully replace the work produced by the human hand?

So the children of the poor are destined by the community to become "menials" of the future, and moreover, the parents of these children are expected to be deeply obliged for the "education" their offspring is thus receiving.

The "Future" should not always be held up for children's imagination as a mysterious and frightful phantom, for the sake of which they have to struggle and learn things that are perfectly indifferent, if not even distasteful, to them. Let children be happy in the present and do things just for to-day; but let the educator consider it as *his duty* to see that the children's work of to-day is laying a steady foundation for the requirements of the future.

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